



A call for research exploring social media influences on mothers' child feeding practices and childhood obesity risk

Allison E. Doub ^{a,*}, Meg Small ^b, Leann L. Birch ^c

^a Pennsylvania State University, Department of Human Development and Family Studies, College of Health and Human Development, USA

^b Pennsylvania State University, Bennett Pierce Prevention Research Center for the Promotion of Human Development, USA

^c University of Georgia, Department of Foods and Nutrition, College of Family and Consumer Sciences, USA

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ABSTRACT

There is increasing interest in leveraging social media to prevent childhood obesity, however, the evidence base for how social media currently influences related behaviors and how interventions could be developed for these platforms is lacking. This commentary calls for research on the extent to which mothers use social media to learn about child feeding practices and the mechanisms through which social media influences their child feeding practices. Such formative research could be applied to the development and dissemination of evidence-based childhood obesity prevention programs that utilize social media. Mothers are identified as a uniquely important target audience for social media-based interventions because of their proximal influence on children's eating behavior and their high engagement with social media platforms. Understanding mothers' current behaviors, interests, and needs as they relate to their social media use and child feeding practices is an integral first step in the development of interventions that aim to engage mothers for obesity prevention. This commentary highlights the importance of mothers for childhood obesity prevention; discusses theoretical and analytic frameworks that can inform research on social media and mothers' child feeding practices; provides evidence that social media is an emerging context for social influences on mothers' attitudes and behaviors in which food is a salient topic; and suggests directions for future research.

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1. Introduction

For the past decade nearly one-in-five children in the United States have been classified as obese (Ogden, Carroll, Kit, & Flegal, 2014). There is increasing evidence that the first five years of life are a critical period for childhood obesity prevention (Cunningham, Kramer, & Narayan, 2014; Druet et al., 2012; Gillman et al., 2013; Paul et al., 2009). Innovative research identifying modifiable risk and protective factors and potential intervention opportunities during infancy and early childhood is necessary to address this important public health issue (Bentley et al., 2014; Nader et al., 2012). There is growing interest in leveraging social media for childhood obesity prevention due to the high prevalence of use. The use of social media platforms, such as Facebook ([Facebook](#)

[Internet]), Twitter ([Twitter \[Internet\]](#)), and Instagram ([Instagram \[Internet\]](#)), has increased among online adults from 16% in 2006 to nearly 75% in 2014 (Pew Research Center, 2014a). In this commentary, "social media" are defined as Internet-based platforms that allow users to create unique personal profiles, contribute and access searchable digital content (e.g., text, images, videos, hyperlinks to other webpages intended to inform, entertain, or sell products), form online relationships with other social media users, and view these social connections (Kane, Alavi, Labianca, & Borgatti, 2014). Social media platforms are accessible through Internet-connected devices including computers, tablets, and smartphones. Although social media may be an innovative setting for childhood obesity prevention initiatives, the evidence base for how social media currently influences behavior and how interventions could be developed for these platforms is lacking (Shin et al., 2014; Tobey et al., 2014; Valente, Palinkas, Czaja, Chu, & Brown, 2015).

Systems frameworks of obesity development suggest factors within broader social and environmental contexts contribute to obesity risk (Davison & Birch, 2001; Davison, Jurkowski, & Lawson,

* Corresponding author. Department of Human Development and Family Studies, College of Health and Human Development, Pennsylvania State University, 115 Health and Human Development University Park, 16802, PA, USA.

E-mail address: aed5142@psu.edu (A.E. Doub).

2013; Hall, Hammond, & Rahmandad, 2014; Harrison et al., 2011; Institute of Medicine (IOM), 2012). The attitudes and behaviors conveyed by family, peers, and media affect social norms and individual-level decisions related to food intake, physical activity, and body weight (Ajzen et al., 2012; Bandura and 1998; Hammond and 2010; Nestle et al., 1998; Rosenstock, Strecher, & Becker, 1988). Although the Internet and social media may influence numerous risk factors for childhood obesity (e.g., physical activity) (Eysenbach, Powell, Kuss, & Sa, 2002; Eysenbach and 2008; Pagoto et al., 2013), this commentary serves as a specific call for research on the extent to which mothers use social media to learn about child feeding practices and the mechanisms through which social media influences their child feeding practices. "Child feeding practices" are defined as attitudes and behaviors related to what to feed children (i.e. the types and portion sizes of food and beverages), how to feed children (e.g., restricting certain foods, responding to hunger and fullness cues), as well as the extent to which mothers model the consumption of a healthy diet (Faith, Scanlon, Birch, Francis, & Sherry, 2004; Gevers, Kremers, de Vries, & van Assema, 2014; Musher-Eizenman et al., 2007). Formative research on mothers' social media use and its influence on their child feeding practices could be applied to the development and dissemination of evidence-based childhood obesity prevention strategies that utilize social media.

To encourage researchers in the fields of public health, human development, and nutrition to pursue research on the extent to which mothers use social media to learn about child feeding practices and the mechanisms through which social media influences their child feeding practices, this commentary first highlights the importance of mothers for childhood obesity prevention. It then describes three theoretical and analytic frameworks that could inform research on child feeding practices in the context of social media. Next, the commentary provides evidence that social media platforms are increasingly adopted online social contexts in which food and eating behavior are salient topics. The commentary concludes by offering specific directions for future research.

2. Mothers' child feeding practices influence Children's risk for obesity

During infancy and early childhood, mothers (i.e. primary caregivers) have substantial control over children's food choices, such as determining when, where, what, and how much children eat (Anzman, Rollins, & Birch, 2010; Birch et al., 1998; Gable & Lutz, 2000). On average, mothers spend more time than fathers on child feeding tasks, such as grocery shopping, preparing food, and eating with children, which suggests mothers are the primary nutritional gatekeepers in many households (Bureau of Labor Statistic, 2013). Previous studies have found associations between mothers' child feeding practices and children's food intake and weight status (Faith et al., 2004; Gerards & Kremers, 2015). Children who experience overtly restrictive or indulgent (i.e. permissive, child controlled) feeding are more likely to be overweight or obese than children whose mothers do not engage in these practices (Chaidez, McNiven, Vosti, & Kaiser, 2014; Rodgers et al., 2013; Wehrly, Bonilla, Perez, & Liew, 2014). Children whose mothers model the consumption of healthy foods (e.g., vegetables and fruit) are more likely to consume healthier diets (Entin, Kaufman-Shriqui, Naggan, Vardi, & Shahar, 2014; Gregory, Paxton, & Brozovic, 2011). Responsive feeding practices that encourage children to consume balanced diets and that are contingent with children's developmental stage and hunger and fullness cues may promote children's self-regulation of eating behavior and help to prevent obesity (Paul et al., 2014). Efforts to improve mothers' child feeding practices to date have predominately focused on individual-level influences

(e.g., mothers' knowledge and attitudes about nutrition) rather than external social or environmental influences (Paul et al., 2014; Waters et al., 2011). Research exploring social and environmental influences on mothers' child feeding practices is needed to understand how to promote responsive feeding practices and prevent overtly restrictive and indulgent feeding practices throughout infancy and early childhood (Davison et al., 2013).

3. Theoretical and analytic frameworks that can inform research on child feeding practices and social media

3.1. Systems theory

Frameworks of childhood obesity risk that are based in systems theory emphasize the transactional nature of risk and protective factors that operate at numerous levels, ranging from genetics to national policies (Davison & Birch, 2001; Davison et al., 2013; Hall et al., 2014; Harrison et al., 2011; Skinner et al., 2013). Although child weight status is the outcome of interest, its determinants are multi-factorial and include interactions among individuals and their families, peers, communities, and cultures. As just described, mothers' child feeding practices are an important contributor to children's risk for obesity, particularly during the first few years of life. Systems frameworks propose mothers' child feeding practices are both influenced by, and contribute to, the norms that exist within their social groups (Davison et al., 2013). Individual-level attitudes and behaviors are impacted by social norms, which are formed through explicit and implicit social influences (Higgs, 2015; Higgs & Thomas, 2016). Explicit social influences are the observable beliefs, behaviors, and available opportunities in ones' social networks (e.g., awareness of others' public eating behaviors, expressed opinions, and opportunities to engage in certain behaviors). Implicit social influences are processes that are not explicitly cognitively processed and include mechanisms such as behavioral synchrony (e.g., eating when others are eating), adoption of implicit weight norms shared by ones' social group, or behavioral economic processes and biases. The media can also contribute to social norms through explicit and implicit mechanisms (Lapinski et al., 2005). Media influences on child feeding practices are included in existing systems frameworks, however, the rapid growth of *social media* may require these models to be revised to include social media as a novel media context that can facilitate family, peer, and cultural influences on social norms (Li, Barnett, Goodman, Wasserman, & Kemper, 2013).

Previous studies on the predictors of mothers' child feeding practices have primarily focused on individual-level factors including maternal demographic characteristics (e.g., education), mental health (e.g., depression, eating pathology), and weight status (Blissett et al., 2011; Cachelin et al., 2013; Francis, Hofer, & Birch, 2001; Haycraft & Blissett, 2008; McPhie, Skouteris, Daniels, & Jansen, 2014), or on children's weight status, appetitive traits and temperament (Blissett et al., 2007; Carnell, Benson, Driggin, & Kolbe, 2014; Haycraft et al., 2012; Webber, Cooke, Hill, & Wardle, 2010). Studies that have examined social and environmental influences on child feeding practices have mostly been limited to the breastfeeding period. These studies suggest mothers' understanding of breastfeeding and the messages they receive about breastfeeding from their partners, family members, and peers impact their initiation and duration of breastfeeding (Cameron, Hesketh, Ball, Crawford, & Campbell, 2010; Rempel et al., 2004; Street et al., 2013). One unique study examined the association between advertisements for infant "hand feeding" in a popular parenting magazine (i.e. advertisements for infant formulas, cereals, and other solid foods) and breastfeeding rates in the United States between 1972 and 2000. The results suggested that when the

frequency of hand feeding advertisements increased, the rate of breastfeeding significantly decreased the following year (Foss et al., 2006). These studies offer some evidence that social and environmental influences can impact mothers' child feeding practices, however, research extending beyond the breastfeeding period and including social media as a new social context is needed (Li et al., 2013; McPhie et al., 2014).

3.2. Social network analysis and theory

Social media platforms allow individuals to form and maintain social relationships over the Internet. Previous studies have found that in-person social networks can protect against or promote obesity depending on how the characteristics of the individual interact with those of his/her social group (Christakis & Fowler, 2007; Cohen-Cole et al., 2008; Leahey, Doyle, Xu, Bihuniak, & Wing, 2015). To date, research has yet to examine the role of social media in creating and maintaining relationships that influence mothers' child feeding practices. Social network analysis is a relevant field of research concerned with the structure and function of relationships (Kadushin, 2012; Wasserman and Faust, 1994; Wellman & Berkowitz, 1988). A recent meta-analysis found interventions based on social network theory and delivered via social media were among those with the strongest effects on health-related behavior change (Laranjo et al., 2015). Social network theory offers several principles of relationship (i.e. "tie") formation that could inform hypotheses about the social network contexts in which mothers obtain information about child feeding practices on social media. Preferential attachment suggests individuals are more likely to form ties with other individuals who are already highly connected in the network (Newman and 2001). This implies social media "influencers" who have a large number of friends and followers are particularly important for determining the tone and content of conversations about topics related to child feeding practices, particularly mothers' brand preferences (Goodman, Booth, & Matic, 2011).

Homophily suggests relationships are more likely to form among individuals who share similar characteristics (e.g., similar demographic characteristics, attitudes, interests) (McPherson, Smith-Lovin, & Cook, 2001). One experimental study of relationship formation within an online exercise community found that users established relationships based on similarities in physical characteristics including age, gender and body mass index, even though these traits were observable only through text (i.e. no photographs were included) (Centola et al., 2015). In contrast, users did not form relationships, homophilous nor heterophilous, based on traits related to health values such as exercise goals (Centola et al., 2015). These findings suggest easily observable characteristics such as physical and demographic attributes may be more important than values about child health and nutrition in determining who is likely to connect on social media for information about child feeding practices.

Even though relationships on social media are somewhat more likely to form among individuals who share a geographic location (Takhteyev, Gruzd, & Wellman, 2012), mothers can access information that is shared by anyone over the Internet, presenting new opportunities for information diffusion, including the dissemination of evidence-based information. Social media platform features may influence the composition of mothers' online social networks. Platforms with features enabling more direct communication and reciprocated relationships among users such as Facebook may be more likely to encourage online relationships among individuals who have or previously had in-person contact (e.g., family members, peers from work, school, or leisure settings) (Ellison et al., 2013; Sosik et al., 2014). Platforms that allow users to form

unreciprocated ties, such as Twitter, Pinterest, Instagram, and blogs (i.e. User A can form a tie with User B but User B may or may not choose to form a tie with User A), may encourage ties among individuals who have not met in person (Ellison et al., 2013). The extent to which mothers are accessing reciprocal close ties (e.g., family, friends) versus unreciprocated distant ties (e.g., celebrities, brands, public health groups) for information about child feeding practices and how ties of each kind influence mothers' actual behavior is currently unknown.

3.3. Social cognitive theory

Social cognitive theory (Bandura, 1986a) offers several intrapersonal mechanisms through which social and environmental factors, including social media, may influence mothers' child feeding practices. Social cognitive theory proposes individuals learn behaviors through selectively observing, remembering, and reproducing behaviors that are modeled and reinforced within social groups (Fryling, Johnston, & Hayes, 2011). Factors such as social status and perceived similarity of the model to the observer affect the likelihood of acquiring behaviors through social learning (Bandura, 1986a). Social cognitive theory is a commonly cited framework in health behavior change interventions delivered online (e.g., through websites and forums) (Webb, Joseph, Yardley, & Michie, 2010). Social media may be an emerging context for social influence because it enables users to easily observe, contribute, and reinforce attitudes and behaviors within social groups. Social media is likely to facilitate social learning in ways that other online contexts do not, such as webpages that do not facilitate relationships or on which the source of information is unclear. Select functions of social media, potential mechanisms of social influence from a social cognitive framework, and platform specific terminology are described in Table 1.

Information shared on social media may help mothers learn about the social norms related to child feeding practices that exist within their social groups. These social norms may reinforce existing behaviors or promote behavior change such that mothers adjust their behavior to more closely resemble their online peers. A recent meta-analysis of experimental studies examining the influence of social norms on adult eating behavior found that observing or having prior knowledge of what foods other individuals had consumed influenced the types and amount of food participants consumed (Robinson, Thomas, Aveyard, & Higgs, 2014). Viewing photos of food alone has been shown to activate areas of the brain associated with appetite (Frank et al., 2010; van Meer, van der Laan, Adan, Viergever, & Smeets, 2015) and induce sensory specific satiety (Larson, Redden, & Elder, 2014). Research is needed to identify the intrapersonal mechanisms through which exposure to information about child feeding practices influences mothers' attitudes and behaviors, including those proposed by social cognitive theory.

4. Social media is an emerging context for social influence, particularly for mothers

The Internet and social media are increasingly used to facilitate social interactions and information exchange as they are integrated into school, work, home, and leisure contexts (Pew Research Center, 2014b) Internet use among adults increased from 66% in 2005–87% in 2014 (Pew Research Center, 2014a) As of January 2014, Internet use did not differ significantly by gender, race, or community type (i.e. urban, suburban, rural), however it was significantly lower among older adults and those with less education and lower incomes (Pew Research Center, 2014c). Younger adults 18–49 years of age were highly engaged with the Internet and mobile technology:

Table 1

Select social media functions, potential mechanisms of social influence, and platform specific terminology.

Function	Potential mechanism of social influence	Platform: Terminology
Form online relationships	Creates an online social network whose attitudes and behaviors are observable through social media activity (i.e. content contributions, endorsements, and direct communication); Homophilous and strong ties may reinforce existing behavior whereas heterophilous or weak ties may encourage behavior change	Facebook: Friend (Profiles); Like (Pages) Twitter: Follow Pinterest: Follow Instagram: Follow Blogs: Follow via direct webpage visitation or Rich Site Summary (RSS) feed
Contribute and categorize/label content	Content may convey users' attitudes and behaviors and establish social norms within online communities	Facebook: Post; Hashtag Twitter: Tweet; Hashtag Pinterest: Pin; Hashtag; Pinboard names Instagram: Share; Hashtag Blogs: Post; Tag or category
Browse and search content	Exposes users to content that may reinforce existing attitudes and behaviors or introduce new attitudes and behaviors	Facebook: News Feed Twitter: Timeline Pinterest: Home Feed Instagram: Home Tab/Feed Blogs: Homepage or RSS Feed
Endorse content	Reinforces social norms through affirming content that other social media users have created	Facebook: Like, Share Twitter: Favorite; Retweet Pinterest: Heart; Repin Instagram: Like Blogs: Share
Direct Communication	Allows for social pressure and support to be exchanged among users	Facebook: Comment; Message; Tag other users Twitter: Reply; Mention; Direct message Pinterest: Comment; Message Instagram: Comment; Message; Tag other users Blogs: Comment

93%–97% used the Internet (Pew Research Center, 2014c) and 74%–83% used smartphones (Pew Research Center, 2014d).

Individuals use social media platforms to maintain and build social relationships (Ellison et al., 2013), gather health information (Pagoto et al., 2013), learn about current events (Purcell, Rainie, Mitchell, Rosenstiel, & Olmstead, 2010), and for entertainment (Ellison et al., 2013). Social media platforms are also used by companies for marketing purposes (Constantinides & Fountain, 2008; Freeman et al., 2014). In September 2014, 52% of adult Internet users had at least two social media profiles (Duggan, Lenhart, Lampe, & Ellison, 2015). Facebook was the most popular platform, used by 71% of online adults overall and accessed daily by 70% of Facebook users (Duggan et al., 2015). There was some evidence of racial and ethnic disparities in social media use by platform, such that Twitter and Instagram were more highly used by Black and Hispanic adults, whereas Pinterest was more highly used by White adults (Duggan et al., 2015).

Mothers are highly engaged with the Internet and social media and use these tools to seek information about parenting and child health (Asiodu, Waters, Dailey, Lee, & Lyndon, 2015; Ondie et al., 2014; Dworkin, Connell, & Doty, 2013; Radey & Randolph, 2009). Mothers have also expressed interest in joining online communities focused on child health (Mitchell, Godoy, Shabazz, & Horn, 2014). In 2014, women were more likely than men to use Facebook (77% vs. 66%), Pinterest (42% vs. 13%), and Instagram (29% vs. 22%) (Duggan et al., 2015). In a similar pattern, mothers were more engaged with some social media platforms compared to fathers, including Facebook (81% vs. 66%), Pinterest (40% vs. 15%), and Instagram (30% vs. 19%) (Duggan et al., 2015). Mothers were more likely than fathers to use social media to obtain parenting information and to receive social and emotional support on parenting issues (Duggan et al., 2015). Additionally, the majority of mothers of young children read blogs (McDaniel, Coyne, & Holmes, 2012), which are frequently updated personal webpages increasingly connected to other social media platforms through hyperlinks (Kane et al., 2014; Park, 2003). Because it is clear that mothers are

highly engaged with social media in the general areas of parenting and child health, research is needed to describe the content and delivery of information relevant to child feeding practices mothers are likely to obtain from these platforms (Bentley et al., 2014; Li et al., 2013).

5. Several social media platforms expose users to food-related digital content

The volume, velocity, and variety of data generated on social media makes it challenging to quantify the amount of content dedicated to any given topic (Manovich and Gold, 2012). That said, there is preliminary evidence to suggest several social media platforms expose users to food-related digital content. Examples of food-related digital content that may be shared on social media platforms include text, images, and/or videos about meals consumed at home or away from home, food or beverage products and/or restaurant endorsements, and hyperlinks to recipes found on blogs or other websites containing recipes. Mothers who observe such content on social media may develop perceived social norms about the types and amount of food they should consume and feed to their children. Few studies have specifically looked at content specific to child feeding practices on social media, which is a critical next step to inform future research and intervention studies that aim to leverage social media for childhood obesity prevention. The following studies are examples of food-related research conducted across various social media platforms that can inform future studies specific to child feeding practices.

Pinterest is one social media platform that allows users to collect, share, and endorse information about food. Pinterest users create categorized groupings of images that are hyperlinked to the original content source. Individually, the hyperlinked images are referred to as "Pins." As a categorized grouping, they are referred to as "Pinboards." (Chang, Kumar, Gilbert, & Terveen, 2014; Gilbert, Bakhshi, Chang, & Terveen, 2013; Hall & Zarro, 2013; Mittal, Gupta, Dewan, & Kumaraguru, 2014; Pinterest, 2015) Hall and

Zarro (2013) analyzed a random sample of 1000 pins collected between February and March 2012 and found pins depicting food and beverages were the single largest category (15%). Pins depicting home and garden décor were the next largest category (14%), which may have contained images related to eating contexts such as kitchens and dining rooms. Blogs were the original content source for 45% of sampled pins, indicating these two social media platforms are closely connected (Hall & Zarro, 2013). Ecommerce sites (i.e. webpages primarily intended to sell products) were the next most frequent source of original content (10%). This finding suggests Pinterest users are frequently exposed to food-related images and are often able to easily purchase products they see endorsed by other users. Mothers who use Pinterest may create and follow Pinboards that focus on child feeding topics (e.g., snacks for toddlers, family dinner recipes). Future studies should examine the extent to which mothers use Pinterest to obtain ideas about child feeding practices and the sources of information they draw upon to create their own Pinboards (e.g., friends, family, food bloggers). Research should also explore how Pinterest influences mothers' attitudes and behaviors, such as the types of food brands they purchase and the types of recipes they prepare for their children.

Food blogs offer information about recipes, food products, and restaurants that may inform readers' social norms regarding what and how much to eat. Food blogs written by mothers and focused specifically on child and family feeding may be particularly likely to influence mothers' child feeding practices; mothers may view food bloggers as domain experts and relatable social models and thus be more likely to take action on their recommendations (Higgs, 2015; Higgs & Thomas, 2016). The types of recipes food bloggers prepare and the nutritional quality of those recipes could impact children's dietary quality if mothers prepare recipes they obtain from food blogs. In a small study examining the nutrition profiles of 96 recipes found on six general food blogs, Schneider et al. (Schneider, McGovern, Lynch, & Brown, 2013) found recipes were within one-third of the adult dietary reference intake for calories ($M = 516$ calories), but exceeded dietary recommendations for saturated fat and sodium content. Over one-third (38%) of sampled recipes were for vegetarian dishes, and these dishes were significantly lower in calories, saturated fat, and sodium than recipes that contained red meat or poultry (Schneider et al., 2013). Additional studies examining a larger sample of recipes and food blogs, particularly blogs created to appeal to mothers feeding young children, would provide further insight into the information about the types and portion sizes of foods endorsed for children's consumption on food blogs.

Twitter users share food-related content related to the main meals of the day, which suggests mothers who use Twitter may be exposed to information relevant to eating behavior and child feeding practices even if they were not initially seeking it out when accessing the platform. Fried et al. (Fried, Surdeanu, Kobourov, Hingle, & Bell, 2014) collected a sample of over 3.5 million tweets containing a selection of food-related labels (i.e. "hashtags") between October 2013 and May 2014. Among the sampled food-related hashtags, the most common hashtag was #dinner, found in 32% of collected tweets, followed by #breakfast (27%) and #lunch (26%). Less than 10% of tweets contained the remaining sampled hashtags: #brunch, #snack, #meal, and #supper. Twitter users may be sharing text, images, videos, or hyperlinks to webpages about what they consumed or plan to prepare for their meals along with these hashtags. Future studies should explore the amount of content that is relevant to child feeding practices by examining more domain specific hashtags such as #breastfeeding, #PickyEater, or #FamilyMeals. Future studies should also explore how receiving reinforcement for sharing content related to certain child feeding practices (e.g., rewarding a toddler with candy for good behavior or

preparing family meals) influences the likelihood the behavior is sustained.

Facebook is another social media context in which mothers may be exposed to food-related digital content, which may include food and beverage marketing. Food and beverage companies can use Facebook to advertise to users by creating company unique profiles (i.e. "pages"), which allow them to form online relationships with other users, contribute content (e.g., images, videos, games, giveaways, polls), and engage with other users (i.e. endorse their content and/or directly communicate) (Constantinides & Fountain, 2008; Freeman et al., 2014). Freeman et al. (Freeman et al., 2014) found over 277.5 million Facebook users from across the globe had endorsed (i.e. "liked") food companies among their sample of 27 food company pages. Young adults 18–24 years of age were the most frequent group to endorse the sampled food company Facebook pages (Freeman et al., 2014). Facebook users can see the pages that members of their online social network (i.e. "friends") have endorsed, which may establish social norms around the food brands and products mothers purchase for themselves and their children. Previous qualitative research has found mothers endorse companies as a source of information about parenting and child development, which suggests it is important to understand the quality of content companies provide to mothers who engage with their social media pages (Asiodu et al., 2015). Future studies should explore which food companies target mothers of young children on social media, as well as the characteristics of mothers who choose to engage with these companies on social media.

6. Conclusions and future directions

Childhood obesity remains a persistent health problem in the United States affecting nearly 20% of children (Ogden et al., 2014). Children who enter kindergarten overweight or obese are more likely to develop obesity in later childhood (Cunningham et al., 2014), which underscores the importance of early prevention (Paul et al., 2009). To date, there is limited empirical evidence to inform the development of effective interventions that aim to leverage social media to prevent childhood obesity (Tobey et al., 2014). This commentary draws upon various theoretical and analytic frameworks to propose social media is an emerging context for social influence on mothers' child feeding practices, which have a proximal influence on children's risk for obesity. Social network theory and social cognitive theory are relevant frameworks that could inform research on the mechanisms through which social media influences mothers' child feeding practices. Given that mothers are highly engaged with social media in the general areas of parenting and child health and these platforms contain food-related content, future studies should examine whether social media platforms such as Pinterest, Twitter, blogs, and Facebook influence child feeding practices. In particular, research is needed to explore how the content and delivery of information on social media attracts and engages mothers, prompts behavior change, and sustains behavior change to have a lasting impact on child feeding practices and children's risk for obesity.

One specific area of future research relates to how mothers build and maintain social networks to obtain information about child feeding practices on social media. Studies should explore how mothers form ties based on easily observable traits such as demographic characteristics or parenting stage (e.g., pregnancy, infancy, toddlerhood, school-aged) and more subtle characteristics such as attitudes toward child feeding practices. Previous research on naturally occurring ties on Twitter (Wu, Hofman, Mason, & Watts, 2011) and Pinterest (Chang et al., 2014; Gilbert et al., 2013), and experimental research on an online exercise community (Centola et al., 2015), suggest individuals form homophilous

relationships, which may serve to maintain rather than change behavior. Research is needed to test how the structure and composition of social media relationships influence mothers' child feeding practices in combination with the information that is shared. Such research could guide the development of interventions that use social network concepts to promote positive child feeding practices. Potential intervention opportunities include engaging social media influencers to disseminate evidenced-based information and facilitating the formation of new ties that expose individuals to new information and social support for positive child feeding practices (Shin et al., 2014; Valente et al., 2015). This is a promising avenue given the evidence that social network-based interventions have effectively promoted behavior change in related domains such as encouraging exercise (Zhang, Brackbill, Yang, & Centola, 2015) and weight loss (Poncela-Casasnovas et al., 2015).

Additionally, research should explore when mothers form their attitudes about infant and early childhood feeding practices and how the information they obtain on social media during that timeframe influences their attitudes and behaviors (e.g., during preconception, pregnancy, toddlerhood). Previous research on mothers' breastfeeding intention and duration found the majority of mothers decided whether to breastfeed prior to conception or during their first trimester of pregnancy (Lawson et al., 1995) and social support for breastfeeding was an important predictor of long-term breastfeeding intention (i.e. beyond 9-months) (Rempel and 2004). A recent qualitative study found that while mothers and their partners used the Internet and social media to learn about pregnancy and receive social support, few could recall finding information about infant feeding from these sites (Asiodu et al., 2015). Research that explores how to deliver memorable and impactful information about child feeding practices during the timeframe when mothers' form their attitudes about child feeding is a critical next step for developing effective childhood obesity prevention programs.

Finally, studies are needed on the role of food companies and public health-oriented groups in informing mothers' child feeding attitudes and behaviors on social media. Even though government and non-profit groups are more likely to promote evidence-based content than corporations (Adams, 2010), they are less likely to have social media profiles or engage with other social media users (i.e. endorse their content or directly communicate) when they are represented on these platforms (Lovejoy, Waters, & Saxton, 2012). Government, non-profit, and academic groups that are already attempting to use social media to prevent childhood obesity could offer insight into how evidence-based information about child feeding practices could be effectively disseminated by reporting on the successes and challenges of strategies they have used to engage users and share content (Tobey et al., 2014; Spring, Gotsis, Paiva, & Spruijt-Metz, 2013).

There is growing enthusiasm to use large-scale data, including data collected from social media platforms, to address public health issues (Kaplan, Riley, & Mabry, 2014). Childhood obesity is a research area of public health importance that would benefit from studies using such data. Research on the extent to which mothers use social media platforms to learn about child feeding practices and the mechanisms through which social media influences their attitudes and behaviors is needed to determine how these highly accessed contexts could be manipulated to promote healthy and responsive child feeding practices. Integrating multiple frameworks of social influences on health behaviors, including systems theory, social network analysis, and social cognitive processes, is a useful approach for future research that aims to leverage social media for childhood obesity prevention.

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